JFW

AF/2121

PTO/SB/21 (03-03)
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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	09/686,112
Filing Date	10/10/2000
First Named Inventor	Love
Art Unit	2121
Examiner Name	Hirl, Joseph P.
Attorney Docket Number	HRL030

Total Number of Pages in This Submission: 88

ENCLOSURES *(Check all that apply)*

- [x] Fee Transmittal Form
  - [ ] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
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- [ ] CD, Number of CD(s) _____
- [ ] After Allowance Communication to a Technology Center (TC)
- [x] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [x] Other Enclosure(s) (please Identify below):

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Remarks

3 copies of the Appeal Brief (20 pages) plus 6 page Appendix A, 2 page Appendix B.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual	Tope-McKay & Associates
Signature	
Date	04/21/2004

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Typed or printed	Cary Tope-McKay		
Signature		Date	04/21/2004

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FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 330.00

Complete if Known	
Application Number	09/686,112
Filing Date	10/10/2000
First Named Inventor	Love
Examiner Name	Hirl, Joseph P.
Art Unit	2121
Attorney Docket No.	HRL030

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☑ Credit card ☐ Money Order ☐ Other ☐ None

☐ Deposit Account:

Deposit Account Number

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The Commissioner is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☐ Credit any overpayments

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Extra Claims		Fee from below		Fee Paid
Total Claims		-20** =		X	=
Independent Claims		- 3** =		X	=
Multiple Dependent					=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	330.00
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 330.00

SUBMITTED BY				(Complete *(if applicable)*)	
Name (Print/Type)	Cary Tope-McKay	*Registration No. (Attorney/Agent)*	41,350	*Telephone*	310.589.8158
Signature				*Date*	04/21/2004

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OIPE JC06
APR 26 2004
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant: Bradley C. Love

Serial No.: 09/686,112

Filed: 10/10/2000

For: "Method and Apparatus for Incorporating Decision Making Into Classifiers"

On Appeal to the Board of Appeals

Examiner: Hirl, Joseph P

Group Art Unit: 2121

Our Ref: HRL030

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Hon. Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

BRIEF ON APPEAL

Sir:

This is an appeal from the Final Rejection, dated October 21, 2003, for the above-identified patent application.

REAL PARTY IN INTEREST

The present application has been assigned to HRL Laboratories, LLC of Malibu, CA.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences to this application.

STATUS OF CLAIMS

Claims 1, 6, 7, 10, 16, 17, 20, and 26 are rejected.

Claims 2-5, 8, 9, 11-15, 18, 19, and 21-25 are objected to.

Claims 27 and 28 are not under any objections or rejections.

04/28/2004 MAHMED1 00000068 09686112
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Claims 1, 6, 7, 10, 16, 17, 20, 26 are the subject of this appeal. A copy of all claims of the application is contained in the attached Appendix A.

STATUS OF AMENDMENTS

No Amendment after Final Rejection has been entered.

SUMMARY OF INVENTION

A method and apparatus for incorporating decision making into classifiers to provide efficient test recommendations are presented and claimed. The apparatus comprises an explicit system and a classifier, each configured to receive a system state dataset, with the explicit system connected with the classifier, and operative to iteratively perform a combinatory search procedure based on the system state dataset to develop a next test recommendation for the classifier, whereby the classifier performs the next test to generate an objective weighted score. The system state dataset is typically in the form of a vector representing the various features that describe the System State. The apparatus further includes a profit module connected with the classifier and with the explicit system to receive the objective weighted score from the classifier, to add subjective value to the objective weighted score to determine a profit for the test, and to provide the profit to the explicit system to enable the explicit system to assess the value of its next test recommendation, and, iteratively, to generate a best test recommendation based on the maximization of the profit. The apparatus further includes an implicit system configured to receive a system state dataset, and connected with the explicit system to receive the best test recommendation for each system state dataset, and to act as

a function estimator to learn to associate best test recommendations with the system state dataset in order to mimic the explicit system, thereby to enable rapid decision making in situations that are either urgent or well-known.

Although the implicit system may be any probability-based learning system, it is preferably a neural network. The combinatory search procedure performed by the explicit system is preferably simulated annealing.

After the implicit system has been sufficiently trained to mimic the explicit system, the explicit system and the profit module may be separated from the implicit system in order to provide a smaller, lower cost system that approximates the performance of the overall system. This application is especially useful when the system is dealing with a fixed environment, i.e. there are few changes that would be outside the range in which the implicit system was trained.

ISSUES

Issue 1 - Whether Claims 7, 17, and 26 lack compliance with 35 USC 112, fourth paragraph, in that these claims fail to additionally limit the subject matter of the related independent claim.

Issue 2 – Whether Claims 1 and 20 and Claims 6 and 16 are indefinite under 35 USC 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which Appellant regards as the invention. In particular, whether the terms

"mimic" as used in Claims 1 and 20, and "sufficiently mimics" as used in Claims 6 and 16, are relative terms that render the claims indefinite.

Issue 3 - Whether Claim 10 is indefinite under 35 USC 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which Appellant regards as the invention. In particular, whether the preposition "on" used in Claim 10 is confusing.

GROUPING OF CLAIMS

The grounds of rejections and objections which appellant contests herein apply to more than one claim, such additional claims, to the extent separately identified and argued below, do not stand or fall together.

THE ARGUMENT

Issue 1 - Whether Claims 7, 17, and 26 lack compliance with 35 USC 112, fourth paragraph, in that these claims fail to additionally limit the subject matter of the related independent claim.

Claims 7 recites:

*An apparatus for incorporating decision making into classifiers to provide efficient test recommendations as set forth in claim **1**, wherein the System State is a vector.*

Claim 17 recites:

*A computerized method for enhancing decision making into classifiers to provide efficient test recommendations as set forth in claim **10**, wherein the System State is a vector.*

Claim 26 recites:

*A computerized method for enhancing decision making in classifiers to provide efficient test recommendations as set forth in claim **20**, wherein the System State is a vector.*

In the first Office Action dated May 7, 2003, the Examiner objected to Claims 7, 17, 26 under 37 CFR 1.75(c) for lack of compliance with 35 USC 112, fourth paragraph, in that these claims fail to additionally limit the subject matter of the related independent claim. The Examiner stated that *"by definition, the system state is always a vector."*

In the Response to the first Office Action dated May 7, 2003, the Appellant stated that *"[t]he first partial paragraph on page 19 of the present application states, "Note that representing the problem as a vector is appropriate only when the test costs are not affected by which other tests have already been performed." Thus, it is not true that the system state is always a vector as asserted by the Examiner. Therefore, the Applicant submits that Claims 7, 17, and 26 are in compliance with 35 USC 112, fourth paragraph, as they additionally limit the subject matter of the related independent claim. If the Examiner still maintains his objection to these claims, the Applicant respectfully requests*

that the Examiner point out to the Applicant his basis for his interpretation that, by definition, the system state is always a vector."

In the Final Office Action of October 21, 2003, the Examiner finally objected to claims 7, 17, and 26 under 37 C.F.R. 1.75(c) for lack of compliance with 35 U.S.C. 112, fourth paragraph. The Examiner stated that *"these claims fail to additionally limit the subject matter of the related independent claim in that by definition the system state is always a vector."* In response to the Appellant's arguments and a request that the Examiner elaborate and clarify his basis for the objection in the First Office Action dated May 7, 2003, the Examiner further stated that *"[t]o one of ordinary skill in the art, the system state is defined by n coordinates in Euclidean n-space. A vector is a well-known mathematical concept defined by n coordinates in Euclidean n-space. The well accepted methodology of vectors is commonly used to refer to the n coordinates of the system state in Euclidean n-space."*

The following are direct quotes regarding the term "vector" used throughout the disclosure:

Page 17, line 22 to page 18, line 5 states:

In the context of choosing the best subset of tests, a local search algorithm starts out at some state, typically in the form of a vector with an entry for each test indicating whether or not the given test is to be performed. The local search algorithm changes

entries in the vector to indicate whether the test will be run, and accepts a change when the expected profit rises.

As the above quoted section clearly indicates, the system state is *typically* in the form of a vector, and therefore is not limited to a vector form of representation.

Page 19, lines 3 to 9 state:

"*Note that representing the problem as a vector is appropriate only when the test costs are not affected by which other tests have already been performed.* ***FIG. 3(b)*** *represents a problem in which test costs are affected by which other tests have already been performed. In such cases, optimization occurs over a matrix.*"

The Appellant respectfully disagrees with the Examiner's assertion that the system state is always a vector, and particularly the belief that the System State is defined by n coordinates in Euclidean n-space. The System State of the present application cannot simply be described as a vector, with values that are known and unknown. The System State is in actuality much more broad in its scope, and can include multiple test dependencies which exist outside of the simple bounds of a vector. As stated on page 19, lines 3 to 9, "*[n]ote that representing the problem as a vector is appropriate only when the test costs are not affected by which other tests have already been performed.*" This describes the situation in which a test dependency would exist that would bring the System State outside of the traditional definition of a vector. Essentially, when the system is searching for the next test to evaluate, it must navigate a matrix structure for

situations in which there are test dependencies. The state of the search process is part of the System State, and therefore cannot be limited to the definition of a simple vector, which is limited to known and unknown values. Appendix B includes a declaration by the inventor, one of ordinary skill in the art, as to the interpretation of the System State as more than a simple vector. Furthermore, the complete System State of the model can additionally encompass the specification of the classifier, the implicit system, and the explicit system. Thus, the System State is not defined by n coordinates in Euclidean n-space, but is subject to a much broader interpretation.

Based on the prior comments regarding the definition and scope of the System State, Appellant believes that Claims 7, 17, and 26 are in compliance with 35 USC 112, fourth paragraph, as they additionally limit the subject matter of the related independent claim.

Issue 2 – Whether Claims 1 and 20 and Claims 6 and 16 are indefinite under 35 USC 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which Appellant regards as the invention. In particular, whether the terms "mimic" as used in Claims 1 and 20, and "sufficiently mimics" as used in Claims 6 and 16, are relative terms that render the claims indefinite.

Claim 1 recites, inter alia:

"...an implicit system configured to receive a system state dataset, and connected with the explicit system to receive the best test recommendation for each system state

dataset, and to act as a function estimator to learn to associate best test recommendations with the system state dataset in order to mimic the explicit system, thereby to enable rapid decision making in situations that are either urgent or well-known."

Claim 20 recites, inter alia:

"...providing an implicit system configured to receive a system state dataset, and connected with the explicit system to receive the best test recommendation for each system state dataset, and to act as a function estimator to learn to associate best test recommendations with the system state dataset in order to mimic the explicit system, thereby to enable rapid decision making in situations that are either urgent or well-known."

In the first Office Action dated May 7, 2003, the Examiner rejected Claims 1 and 20 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellant regards as the invention. The Examiner stated that *"At Claim 6, line 4 the term "mimic" is used which is a relative term and renders the [sic]claim indefinite."*

Appellant believes the Examiner has made an error in arguing claim 6 under the 35 USC 112, second paragraph, rejection of claims 1 and 20. The term "mimic" appears in paragraph "c" of both claims 1 and 20. In Response to the First Office Action, the

Appellant respectfully disagreed with the Examiner, and stated that *"[t]he present application, page 16, lines 15-17 states "Although the explicit system **202** uses a combinatorial process to determine the best test or tests to run, over time the implicit system **206** learns to mimic the performance of the explicit system **202.**" The Applicant is unclear why the Examiner has asserted that the term "mimic" is relative. The Applicant respectfully requests that if the Examiner continues this rejection of Claims 1 and 20 based on the term "mimic" that the Examiner explain why he believes the term is relative. Because the term "mimic" is used in a definable context in the present application, the Applicant submits that one skilled in the art would understand what the term "mimic" means and thus, the term "mimic" is not indefinite. Therefore, the Applicant respectfully requests that the Examiner withdraw this rejection of Claims 1 and 20."*

In the Final Office Action, dated October 21, 2003, the Examiner finally rejected Claims 1 and 20 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Appellant regards as the invention. The Examiner stated that *"...To one of ordinary skill in the art, the term "mimic" introduces the concept of imitation and with the concept of imitation comes the question of "how much"? Since such a term introduces a sliding scale of interpretation, by consequence the claim is indefinite."*

Claim 6 recites:

*"An apparatus for incorporating decision making into classifiers to provide efficient test recommendations as set forth in claim **5**, wherein the explicit system and the profit module may be separated from the apparatus after the implicit system sufficiently mimics the explicit system."*

Claim 16 recites:

*"A computerized method for enhancing decision making in a classifier system as set forth in claim **15**, wherein the explicit system and the profit module used may be separated from the classifier system after the implicit system sufficiently mimics the explicit system."*

In the first Office Action, dated May 7, 2003, the Examiner rejected Claims 6 and 16 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellant regards as the invention. The Examiner stated that *"At Claim 6, line 4 the term "sufficiently mimics" is used which is a relative term and renders the claims indefinite. Claim 16 has a similar reference."*

In Response to the First Office Action, the Appellant respectfully disagreed with the Examiner, and stated that *"The Applicant disagrees for the same reasons given above with reference to claims 1 and 20. Therefore, the Applicant respectfully requests that the Examiner withdraw this rejection of claims 6 and 16."*

The following are direct quotes regarding the term "mimic" used throughout the disclosure:

Page 16, lines 14+:

*"Although the explicit system **202** uses a combinatorial process to determine the best test or tests to run, over time the implicit system **206** learns to mimic the performance of the explicit system **202**. In situations that are familiar or when a very fast approximation to the performance of the explicit system **202** is required, the implicit system can be used to provide the final decision. In cases where there are a limited number of possible situations, the explicit system **202** may be removed after the implicit system **206** has been fully trained."*

Page 20, lines 15+:

"The implicit system compliments the explicit system by providing almost instantaneous test recommendations. The implicit subsystem is a function approximator that, over time, learns to approximate the performance of the explicit system. Thus, the explicit system provides the teaching signal for the implicit system, which will be discussed in greater detail further below."

Page 26, lines 4+:

"In time critical situations, the implicit system can be queried, while the explicit system can be queried when time is not of the essence. When processor load is low, the explicit system can provide training data to refine the implicit system. In an alternative

embodiment, such as a deployed system with limited processing power, the implicit system can be completely trained by the explicit system while off-line, and the present invention may be deployed without the explicit system."

Page 27, lines 1-3:

"After some training, this input/output mapping closely approximates the output of the explicit system, but requires less computation."

Appellant asserts that the term "mimic" is not relative to the point that the claims are rendered indefinite. To one of ordinary skill in the art, the notion of a learning model coming to approximate, estimate, or mimic some underlying function is accepted in machine learning and statistics (See Appendix B). In the present invention, the function being approximated is the one defined by the input/output mapping of the explicit system, as stated in the application on page 20, lines 15 – 19 (see *infra* page 12). In each application of the learning model, there will be different costs associated with gathering training data, making timely predictions, and making errors. The present invention provides for these varying costs by adjusting the amount of the explicit system to be mimicked by the implicit system, as stated in the disclosure on page 16, lines 14 – 20 and page 26, lines 4 – 9 (see *infra* page 12). Thus, what constitutes adequate mimicry cannot be defined outside of the context of a specific application, since the costs associated with gathering the data, processing the information, and making accurate predictions will vary for each application. While mimicking the outputs of the system 60% of the time may be sufficient in some situations, matching the outputs 99.9% of the time may be inadequate

in others. Therefore, to be specific as to the amount of mimicry occurring would be unnecessarily limiting, as the amount of mimicry varies depending on the type and amount of data and the desire for efficiency based upon the resources available to the system at any time.

Appellant thus believes that the terms "mimic," as used in Claims 1 and 20, and "sufficiently mimics", as used in Claims 6 and 16 is not indefinite under 35 USC 112, second paragraph, for the reasons discussed above.

Issue 3 - Whether Claim 10 is indefinite under 35 USC 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which Appellant regards as the invention. In particular, whether the preposition "on" used in Claim 10 is confusing.

Claim 10 recites:

"A computerized method for enhancing decision making in a classifier system, wherein the classifier system includes an explicit system and a classifier, each configured to receive a system state dataset, with the explicit system connected with the classifier; a profit module connected with the classifier and with the explicit system; and an implicit system configured to receive a system state dataset, and connected with the explicit system, the computerized method comprising the steps of:

a. receiving a system state dataset in the explicit system, the classifier, and the implicit system;

b. determining in the explicit system, based on the feature set, a recommended test;

c. performing the recommended test on the classifier;

d. determining, via the profit module, the profit from the test performed on the classifier;

e. detecting whether the test performed on the classifier maximizes the profit;

f. performing the receiving step a through the detecting step e until a test is found which maximizes the profit;

g. training the implicit system with the system state dataset and the test which maximizes the profit; and

h. repeating steps a through g until a desired level of training of the implicit system is reached."

In the First Office action, dated May 7, 2003, the Examiner rejected Claim 10 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellant regards as the invention. The Examiner stated that *"[a]t Claim 10, lines 10-13, the use of the preposition "on" is confusing [sic]it is really the classifier that is evaluating the test...perhaps the word "by" could be used as a replacement. Without such change, the claim is indefinite."*

In Response to the First Office Action, the Appellant stated that *"The last paragraph on page 15 of the present application states, 'The explicit system **202** runs*

*virtual or hypothetical tests on the classifier **200**, which, in essence, acts as a model of the world in which the system operates.' Thus, as disclosed in the present application, the tests are preformed on the classifier. The Applicant submits that the use of the preposition "on" is appropriate in this case. Therefore, the Applicant respectfully requests that the Examiner withdraw this rejection to Claim 10."*

In the Final Office Action, dated October 21, 2003, the Examiner finally rejected Claim 10 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellant regards as the invention. The Examiner repeated the reasoning given in First Office Action, and further stated that *"...[s]pecification, Fig. 2 applies. Note that the Explicit System is separate and distinct from that of the Classifier. This means that the Classifier will run the recommended test. Hence, the word "by" is correct. These comments apply to steps c, d, and e of claim 10. See also claim 1, step a wherein 'classifier performs.'"*

The following are direct quotes regarding the term "on" with respect to the classifier used throughout the disclosure:

Page 15, lines 20+:

*"The explicit system **202** runs virtual or hypothetical tests on the classifier **200**, which, in essence, acts as a model of the world in which the system operates."*

Page 16, lines 2-9:

*"The profit module **204** tempers the output of the classifier **200** in order to add subjective cost information relative to the set of tests performed in order to determine the profit received by performing the set of tests, i.e. output of the profit module **204** reflects the fact that with each test, there is an associated cost, and that accuracy must be sacrificed if the cost of the test is simply too high to bear. The output of the profit module **204** is provided to the explicit system **202** so that the explicit system **202** may use the feedback to set benchmarks en route to maximizing the profit from the tests. After performing a set of tests based on the feature set input, the explicit system **202** reaches a final decision of the best test or tests to run."*

Page 25, lines 5-8:

*"The classifier **200** is used essentially as a model of the task environment, or world, with experiments being run on the classifier to make predictions about what will transpire in the actual environment. The more veridical the classifier **200** is, the more accurate its predictions will be."*

Page 26, lines 21+:

"In effect, the classifier is used as a model of the task environment and the present invention runs experiments on this model to determine what action to perform next."

The present application discloses in Claim 10 and throughout the disclosure that the Explicit System performs the recommended test on the Classifier. Specifically, where Claim 10 states in steps b and c, "b. determining in the explicit system, based on the

feature set, a recommended test; c. performing the recommended test on the classifier;" the implication of these sections of the claim is that the Explicit System determines a recommended test and thereafter performs the recommended test on the Classifier. The steps of the Explicit System performing a test upon the Classifier are further described in the specification at Page 15, line 20 – 21, which explains how "[t]he explicit system **202** runs virtual or hypothetical tests on the classifier **200**, which, in essence, acts as a model of the world in which the system operates." While the Examiner cites to Fig. 2 of the Specification for the assertion that the Explicit System is separate and distinct from the Classifier, this does not refute the fact that the Explicit System still performs the recommended test on the Classifier as denoted in Claim 10 and throughout the above-referenced sections of the specification.

In Claim 1, step a, which states "an explicit system and a classifier each configured to receive a system state dataset, *with the explicit system connected with the classifier, and operative to iteratively perform a combinatory search procedure based on the system state dataset to develop a next test recommendation for the classifier*, whereby the classifier performs the next test to generate an objective weighted score;" (italics not present in original), the Explicit System is described as connected with the Classifier, where the Explicit System functions to run a test to determine the appropriate test to run on the Classifier, with the Classifier thereafter performing the test part of providing the output of the test to generate the objective weighted score. While admittedly confusing in that the Claim can be interpreted to see the Classifier performing the entire recommended test from the Explicit System, in actuality, the test is performed by the Explicit System on the Classifier, and part of the test "performed" by the Classifier is

only the output of the objective weighted score and essentially the profit from the test performed.

In conclusion, the use of the word "on" in Claim 10 is consistent with the specification and the overall model of the present invention, in that the Explicit System performs the recommended test on the Classifier in order to provide the Classifier with a profit and cost estimate of performing the actual test in the real world. While the Classifier "performs" the function of assembling the profit from the test performed, the overall test is performed by the Explicit System "on" the Classifier to eventually determine which test maximizes the profit and thus which test to then recommend to the Implicit System. Thus, the use of the word "on" is appropriate.

Claim 10 therefore satisfies the requirements of 35 USC 112, second paragraph.

CONCLUSION

For the extensive reasons advanced above, the Appellant respectfully contends that each claim is patentable. Therefore, reversal of all rejections and objections is courteously requested at this time.

Please charge any shortage of fees due in connection with the filing of this paper, to deposit account no. 50-2691 and please credit any excess fees to such deposit account.

Respectfully submitted,

04/21/2004
Date

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Enclosures (2): Appendix A – Pending Claims
Appendix B – Declaration of Inventor

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APPENDIX A

CLAIMS

What is claimed is:

1. An apparatus for incorporating decision making into classifiers to provide efficient test recommendations, the apparatus comprising:

a. an explicit system and a classifier each configured to receive a system state dataset the explicit system connected with the classifier and operative to iteratively perform a combinatory search procedure based on the system state dataset to develop a next test recommendation for the classifier, whereby the classifier performs the next test to generate an objective weighted score;

b. a profit module connected with the classifier and with the explicit system to receive the objective weighted score from the classifier, to add subjective value to the objective weighted score to determine a profit for the test, and to provide the profit to the explicit system to enable the explicit system to i. assess the value of its next test recommendation and ii. to iteratively generate a best test recommendation based on the maximization of the profit;

c. an implicit system configured to receive a system state dataset, and connected with the explicit system to receive the best test recommendation for each system state dataset, and to act as a function estimator to learn to associate best test recommendations with the system state dataset in order to mimic the explicit system, thereby to enable rapid decision making in situations that are either urgent or well-known.

2. An apparatus for incorporating decision making into classifiers to provide efficient test recommendations as set forth in claim **1**, wherein the explicit system and the implicit system are configured to provide test recommendations to a controller.

3. An apparatus for incorporating decision making into classifiers to provide efficient test recommendations as set forth in claim **1**, wherein the implicit system is a neural network.

4. An apparatus for incorporating decision making into classifiers to provide efficient test recommendations at set forth in claim **3**, wherein the neural network is a radial basis neural network.

5. An apparatus for incorporating decision making into classifiers to provide efficient test recommendations as set forth in claim **3**, wherein the combinatory search procedure performed by the explicit system is simulated annealing.

6. An apparatus for incorporating decision making into classifiers to provide efficient test recommendations as set forth in claim **5**, wherein the explicit system and the profit module may be separated from the apparatus after the implicit system sufficiently mimics the explicit system.

7. An apparatus for incorporating decision making into classifiers to provide efficient test recommendations as set forth in claim **1,** wherein the system state is a vector.

8. An apparatus for incorporating decision making into classifiers to provide efficient test recommendations as set forth in claim **1**, wherein the classifier is a probabilistic model.

9. An apparatus for incorporating decision making into classifiers to provide efficient test recommendations as set forth in claim **8**, wherein the classifier is Bayesian.

10. A computerized method for enhancing decision making in a classifier system, wherein the classifier system includes an explicit system and a classifier, each

configured to receive a system state dataset, with the explicit system connected with the classifier; a profit module connected with the classifier and with the explicit system; and an implicit system configured to receive a system state dataset, and connected with the explicit system, the computerized method comprising the steps of:

a. receiving a system state dataset in the explicit system, the classifier, and the implicit system;

b. determining in the explicit system, based on the feature set, a recommended test;

c. performing the recommended test on the classifier;

d. determining, via the profit module, the profit from the test performed on the classifier;

e. detecting whether the test performed on the classifier maximizes the profit;

f. performing the receiving step a through the detecting step e until a test is found which maximizes the profit;

g. training the implicit system with the system state dataset and the test which maximizes the profit; and

h. repeating steps a through g until a desired level of training of the implicit system is reached.

11. A computerized method for enhancing decision making in a classifier system as set forth in claim **10**, wherein the test that maximizes the profit is provided by either the explicit system or the implicit system to a controller.

12. A computerized method for enhancing decision making in a classifier system as set forth in claim **10**, wherein the implicit system used is a neural network.

13. A computerized method for enhancing decision making in a classifier system as set forth in claim **12**, wherein the implicit system used is a radial basis neural network.

14. A computerized method for enhancing decision making in a classifier system as set forth in claim **12**, wherein the determining step b is performed by the explicit system using a combinatory search procedure.

15. A computerized method for enhancing decision making in a classifier system as set forth in claim **14**, wherein the combinatory search procedure performed by the explicit system in the determining step b is simulated annealing.

16. A computerized method for enhancing decision making in a classifier system as set forth in claim **15**, wherein the explicit system and the profit module used may be separated from the classifier system after the implicit system sufficiently mimics the explicit system.

17. A computerized method for enhancing decision making into classifiers to provide efficient test recommendations as set forth in claim **10,** wherein the system state is a vector.

18. A computerized method for enhancing decision making into classifiers to provide efficient test recommendations as set forth in claim **10**, wherein the classifier is a probabilistic model.

19. A computerized method for enhancing decision making into classifiers to provide efficient test recommendations as set forth in claim **18**, wherein the classifier is Bayesian.

20. A computerized method for enhancing decision making in classifiers to provide efficient test recommendations, the computerized method comprising the steps of:

a. providing an explicit system and a classifier each configured to receive a system state dataset, with the explicit system connected with the classifier, and operative to iteratively perform a combinatory search procedure based on the system state dataset to develop a next test recommendation for the classifier, whereby the classifier performs the next test to generate an objective weighted score;

b. providing a profit module connected with the classifier and with the explicit system to receive the objective weighted score from the classifier, to add subjective value to the objective weighted score to determine a profit for the test, and to provide the profit to the explicit system to enable the explicit system to assess the value of its next test recommendation, and, iteratively, to generate a best test recommendation based on the maximization of the profit;

c. providing an implicit system configured to receive a system state dataset, and connected with the explicit system to receive the best test recommendation for each system state dataset, and to act as a function estimator to learn to associate best test recommendations with the system state dataset in order to mimic the explicit system, thereby to enable rapid decision making in situations that are either urgent or well-known.

21. A computerized method for enhancing decision making in a classifier system as set forth in claim **20**, wherein the explicit system and the implicit system are further configured to provide the test recommendation to a controller.

22. A computerized method for enhancing decision making in a classifier system as set forth in claim **20**, wherein the implicit system provided is a neural network.

23. A computerized method for enhancing decision making in a classifier system as set forth in claim **22**, wherein the implicit system provided is a radial bias neural network.

24. A computerized method for enhancing decision making in a classifier system as set forth in claim **22**, wherein the explicit system provided performs the combinatory search procedure by use of simulated annealing.

25. A computerized method for enhancing decision making in a classifier system as set forth in claim **24**, wherein the explicit system provided and the profit module provided may be separated from the classifier system provided after the implicit system sufficiently mimics the explicit system.

26. A computerized method for enhancing decision making in classifiers to provide efficient test recommendations as set forth in claim **20,** wherein the system state is a vector.

27. A computerized method for enhancing decision making in classifiers to provide efficient test recommendations as set forth in claim **20**, wherein the classifier is a probabilistic model.

28. A computerized method for enhancing decision making in classifiers to provide efficient test recommendations as set forth in claim **27**, wherein the classifier is Bayesian.

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APPENDIX B

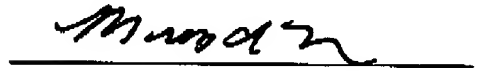
DECLARATION OF INVENTOR BRADLEY C. LOVE

I, Bradley C. Love, of Austin, Texas, am the inventor for application 09/686,112, the "Method and Apparatus for Incorporating Decision Making into Classifiers." I am an assistant professor at the University of Texas at Austin in the Center for Computation and Cognitive Processes, with a Ph.D. in Cognitive Psychology and a B.S. in Cognitive and Linguistic Sciences. I have worked in the area of computer science and cognitive processes for over 10 years, with numerous grants and publications in the field. I do hereby declare the following:

A Vector is not the most natural way to represent the subject matter of the present application. The system state of the present application is not confined to values that are known and unknown. Many cases require searching for the next test by navigating a matrix structure for situations in which there are test dependencies. The state of the search process is thus part of the system state. Additionally, the complete state of the model could encompass the above, plus the specification of the classifier, the implicit system, and explicit system.

With regard to the use of the word "mimic," the notion of a learning model coming to approximate, estimate, or mimic some underlying function is accepted in machine learning and statistics. For example, gradient descent models, such as error-minimizing neural networks, come to approximate or mimic an underlying function over

the course of learning. In the present application, the function being approximated is the one defined by the input/output mapping of the explicit system. What constitutes a sufficient approximation or adequate mimicry cannot be defined outside of the context of a specific application and evaluation metric. Each application will have different costs associated with gathering training data, making timely predictions, and making errors. All of these factors (and more) affect what is adequate mimicry. Matching the outputs of a system 60% of the time may be adequate in some situations, whereas matching 99.9% may be inadequate for other applications. In cases where time is of the essence and the explicit system cannot respond fast enough, any prediction may be desirable. Learning theoreticians working in the PAC (Probably Approximately Correct) learning framework formally specify the probability that an estimation will fall outside certain error bounds given a certain number of training examples for certain classes of problems, but these analyses are not applicable to many practical situations, nor do they dictate what the bounds should be (as discussed above).



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Bradley C. Love, Inventor Date